

**PATTERN OF CANCER IN YEMEN: FIRST RESULT FROM THE NATIONAL
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ABSTRACT

Yemen is a developing country located in the south west of Asia, occupying the south of Arab Peninsula. Cancer is a major public health problem in Yemen, the size of the problem and underlying risk factors is not yet well studied. The aim of this study is to report the pattern of cancers in Yemen. **Material and methods:** Data for the year 2007 available at the cancer registry department in National Oncology Center were used. Descriptive analysis of 3782 cases with various types were registered according to type of cancer, age, sex, site of lesion and governorate and has been analyzed using Epi info 7. **Results:** In 2007, a total of 3782 cases were registered with an equal male to female ratio and median age at diagnosis of 50 years that was slightly lower among females than males: 47 vs. 50 respectively. Among females, breast cancer was the most common cancer (21%) followed by lymphoma (8%) ovary and leukemia (7% each), while among males the most common cancers were lymphomas (11%), leukemia (9%) and liver, stomach and CNS tumors (7% each). Of all registered cases, there were 437 cancer cases (11.6%) aged 15 years old or less with a median age of 7 years. The most common cancer among children were leukemia (24%), followed by non-Hodgkin's lymphoma (17%) and CNS tumors and Hodgkin's lymphoma (10% each). **Conclusions:** Cancer is diagnosed at a relatively younger age in Yemen, especially among females and breast cancer accounts for about a quarter of cases among women. Yemen needs to strengthen regional as well as national cancer registries to determine the burden of cancer in Yemen as a first step for cancer control strategy. Analytical studies are recommended to understand the risk factors and plan prevention and control for the most common cancers such as lymphoma, leukemia and liver cancers.

KEYWORDS: Cancer, Yemen, Incidence, Epidemiology.**INTRODUCTION**

Cancer is a major public health problem in developing countries and worldwide.^[1] Yemen is categorized as a lower-middle income country by the world bank with its population estimated according to Central Statistical Organization (CSO), to have a 22,230,000 population in 2007 (11,170,000 are male and 11,060,000 are female) and the life expectancy at birth being 62.5 years. As most developing countries the population aged under fifteen accounted about 44%.^[2] Cancer is the second most frequent cause of death in the majority of developed countries and number of cancer-related deaths increased from 6 million in the year 2000 to 7.6 millions in 2005 and to 7.9 millions in 2007, revealing a 32% rise in the magnitude of cancer-related deaths between 2000 and 2007. Also, in the year 2007, 13% of all deaths around the world were caused by cancer, 72% of 7.9 million deaths took place in developing countries.^[3]

The target population in this program is not limited to any particular class, age, sex, ethnic, or racial groups.

Despite these approved programs, there are many problems: the financial burden of different types of treatment, the advanced stage at presentation of cancer patients, as well as inadequate medical staff training for diagnosis, treatment, palliative care and psychological care of cancer patients. Information related to data collection from different cancer registries have been published in various articles. For example Ba-Saleem et al 2010^[4]; A five year study over the years 2002-2006 made by Aden Cancer Registry (ACR) resulted in registering a total of 1818 new cases in southern governorates of Yemen. Five cancers (Breast, leukemia NH lymphoma, brain tumors and Hodgkin's lymphoma's) are the leading incident cancers over the years 2002-2006 and represent 46.6% of all new registered cases.

Cancer registry in Yemen stills a big challenge in absence of national cancer surveillance. There are three cancer registries: Aden cancer registry and Hadhramout cancer registry, which both are population based cancer registries; and cancer registry at National Oncology

Center (NOC), which was supposed to be a hospital based. Among active cancer registries in Yemen, first Aden Cancer Registry received membership of IACR (International association of cancer registration) in 1998. the reporting of cancer cases to population- based cancer registries is not required by law in Yemen. It is a fact a voluntary task undertaken by professionals representing institution of the region.



Figure 1: Sketch Map of Yemen governorates.

MATERIAL AND METHODS

The study was conducted at National Oncology Center (NOC) which is located at the capital of Yemen, Sana'a. Data for the year 2007 available at the cancer registry department were used. On the first visit for a cancer case, a medical file is issued and unique number is given. In the file there variables such as name of patient, age, sex, address, initial diagnosis and histopathology, cytology or other basis of diagnosis (Radiology images and tumor markers). The files are saved to the archive room however data were regularly updated regarding the final diagnosis, extension and stage of disease, performed treatment, course of cancer disease, follow up of the patient and the outcome of treatment.

Ethical Consideration

The data collection was confidential. Any family who needed any medical help were advised to the best choice possible. The research protocol was approved by the scientific committee of national oncology center.

RESULTS

A total of 3,782 new cancer patients were registered at cancer registry department of NOC. The analysis shows that both males and females have nearly an equal representation with female to male ratio 1:1.

Although cancer is registered in all age groups, including infants and children, the most affected age groups were 50-59 years, followed by 60-69 age group for both genders. The median age at diagnosis was 50 years old for all cases. The median age for females was 47 and for males was 50 years.

For the adult cancer patients aged more than 15 years old the median age at diagnosis for both genders was 50years. The median age for females was 50 years and for males was 55 years.

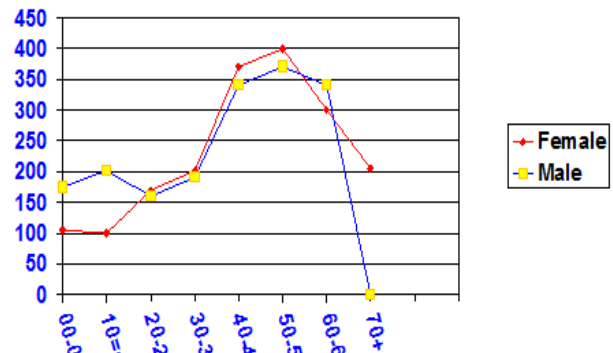


Figure 2: Number of cases by age groups for males and females

As shown in the figure 2 the number of cancer cases increases with the age of patients for both gender with the peak at 50 and 60 years old for females and between 60 and 70 among males.

As shown in figure 3 the crude incidence rate of cancer in Yemen for 2007 was around 17 per 100,000 inhabitants. The incidence rate was different by governorate, where the highest rate was registered in Aden and Sana'a governorates (28 per 100 000) and the least rate was registered for Aljawf governorate (6 per 100 000).

Most of the patients residency are coming from all different parts of the country, with Taiz governorate ranked at the peak followed by capital Sana'a, Ibb, Alhudeidah and Dhamar. In contrast Almaharah, Aljawf, Mareb and Shabwah governorates had the least number of cases.

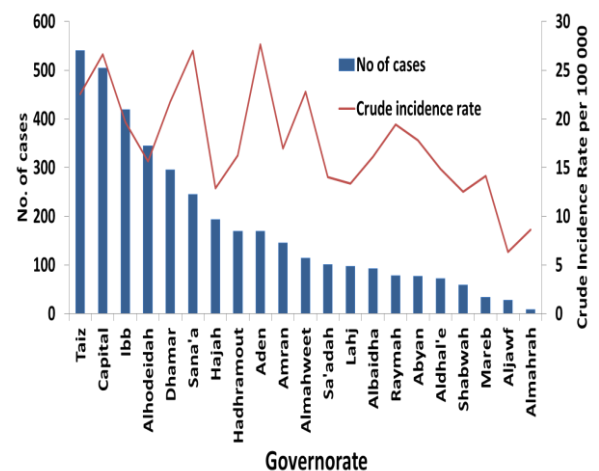


Fig 3. Distribution of cancer cases and crude incidence rate by governorate

Figure 4. Distribution of breast cancer according to age groups

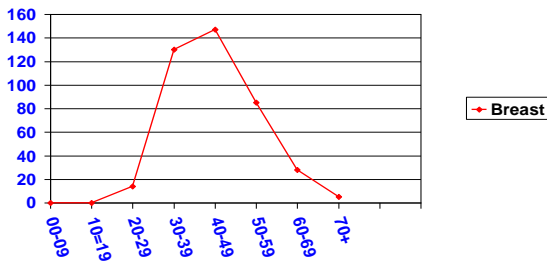
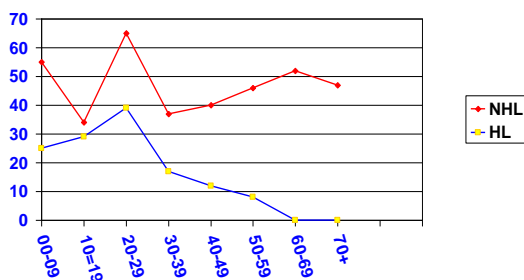
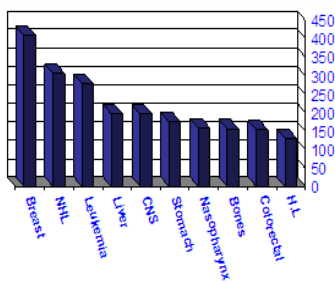


Figure 5. Distribution of lymphoma according to age groups



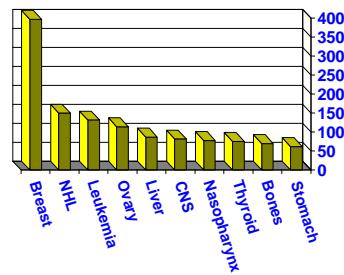
The age group most affected in patients with breast cancer was 40-49 years and 50-59 years. The most common age groups affected by non-Hodgkin's lymphoma (NHL) were 20-29 years followed by 01-09 years age group, while in Hodgkin's lymphoma (HL) the age group affected were 20-29 and 10-19 years age groups.

Figure 6. The 10 most common cancers . Yemen, 2007



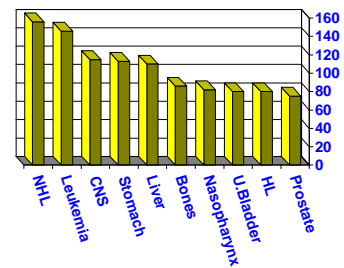
The most common cancer sites for all the cases regardless the gender as shown in the figure 6. were breast cancer accounted 11% followed by non-Hodgkin's lymphoma 8% and leukemia 7.3%. Among females of all ages the most common cancers were breast cancer 21% followed by non-Hodgkin's lymphoma 8% and leukemia 7%.

Figure 7. The 10 most common cancers for female. Yemen, 2007



Among males of all ages the most common cancers, as shown in figure 8, were NHL (11%), followed by leukemia (9%) and CNS tumors (6%).

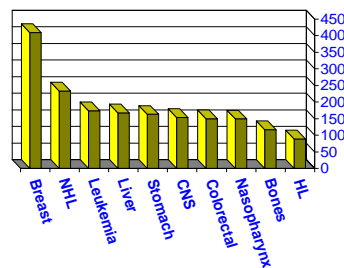
Figure 8. The 10 most common cancers for male. Yemen, 2007



Cancer cases among adult population

Of all registered cases in NOC 2007, there were 3345 (88%) cancer cases among adult patients aged >15 years old. The female to male ratio for cancer cases among adults was 1:1. Figure 9 shows that among adult patients regardless the gender, the most common cancers were breast, non-Hodgkin's lymphoma, leukemia, liver and stomach cancers.

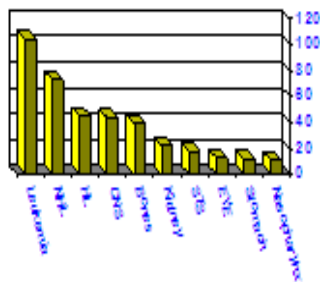
Figure 9. The 10 most common cancers among adults. Yemen, 2007



Cancer cases among childhood population

Of all registered cases, there were 437 cancer cases aged 15 years old or less, which accounted about 11.6% of all registered cases in 2007. The median age for pediatric cancer cases was 7 years (ranged 0-15). As illustrated in figure 10, the most common sites for cancer among children were leukemia 104 cases (24%), followed by non-Hodgkin's lymphoma 73 cases (17%), Hodgkin's lymphoma 45 cases (10.3%) and CNS tumors 44 cases (10 %).

Figure 10. The 10 most common cancers among Children. Yemen, 2007



DISCUSSION

Cancer in developing countries is a growing and soon to be a major problem as life expectancy increases. There are 11 million documented cancer cases worldwide and more than half (6 million) occur in low and middle income countries. The American Cancer Society estimates that this number will increase to 27 million cases by 2050, mainly due to a growing and aging population.^[3] The true cancer incidence in Yemen is unknown due to limited resources for pathology, the scarcity and quality of medical records and limited epidemiology resources, but most importantly because cancer is often hidden and registered in late stages.

The population in Yemen in 2007 (22,230,000) and covered by 3 cancer registries in Sana'a, Aden and Hadramout. The increase and distribution of cancer does not reflect the actual number of cancer cases in Yemen because part of the patients travel seek medical attention at late stages of disease that is only available in Sana'a.

Previous studies by Bawazir *et al* (1998)^[5], Ba-Saleem *et al* (2005)^[4] and Vandenberg *et al* (2009)^[6] suggest that most common cases (generally at advanced stage) include breast, leukemia, lymphoma (NHL, HL) head and neck, especially nasopharynx, gastrointestinal (especially esophagus and gastric, colorectal, hepatocellular carcinoma).

In this study breast was the most common of cancer followed by non-Hodgkin's lymphoma, leukemia, liver and stomach.

Breast cancer ranked the first of all cancers and of cancers among females, where a total of 409 breast cancer cases were registered (11% of all cases and 21% of cancers among adult females). The incidence rate was 4 per 100000 inhabitants. The mean age at diagnosis was 47 years (ranged from 15 to 90). Male breast cancer accounted 4% of all breast cancer cases. The few studies and reports available in Yemen suggest that breast cancer affects Yemeni women at least one decade younger than women in developed countries, with mean age ranging from 47 to 49 years.^[7-8] Overall 409 breast cancer cases documented during this study demonstrated that the crude incidence rate is low in comparison with other countries.

In 2007 there were 367 cases of non-Hodgkin's lymphomas, which accounted 10% of all cancer cases. It ranked the first among male cases and second among all cases, female adult cases and childhood cancer cases. Of all non-Hodgkin's lymphoma cases 59% were males and 41% were females. The mean age at diagnosis was 38 years old. As shown in the figure 5 the most common age groups affected by non-Hodgkin's lymphoma were 20-30, followed by 0-10 years age groups.

An increase in NHL incidence has been noted in many countries, with improvements in diagnostic techniques. The incidence of lymphoma is increasing worldwide, largely due to NHL.^[9] According to available data on cancer in southeastern Yemen (1983-1989), malignant lymphoma was the 2nd most common malignancy; among males it ranked 2nd and among females it ranked the 5th.^[5]

Non-Hodgkin's lymphomas (NHLs) are the second fastest growing cancer in terms of incidence and deaths in the United States and Europe. An estimated 355,900 new cases and 191,400 deaths from non-Hodgkin lymphoma (NHL) occurred in 2008. NHL encompasses a wide variety of disease subtypes for which incidence patterns vary. NHL is more common in developed areas, with the highest incidence rates found in North America; Australia/ New Zealand; and Northern, Western and Southern Europe. The lowest rates are found in South-Central and Eastern Asia and the Caribbean. NHL is the 11th most common cancer in Europe, with around 93,500 new cases diagnosed in 2012 (3% of the total). In Europe (2012), the highest World age-standardized incidence rates for NHL are in Italy for men and the Netherlands for women; the lowest rates are in Albania for both men and women.⁽¹⁰⁻¹¹⁾ In spite of the progresses, conventional therapies do not ensure long-term survival.^[12]

In 2007 there were 130 Hodgkin's lymphoma cases in NOC- Sana'a, 65% of them were male and 35% were female. The mean age at diagnosis accounted 24 years old, which younger than the mean age of Non-Hodgkin's lymphoma cases (38 years old). The most affected age group was 20-30, followed by 10-20, 0-10 and 30-40

years (30%, 22% 19 and 11% respectively). In reports from Western countries HL was more prevalent among young adults (16 years) and the incidence of the disease appear at the peak of the third decade of life (36 years)^[13], which is similar to Abdul Hamid et al (2012) present findings and indicates that there isn't a significant difference in incidence rate of HL based on age.^[14]

Leukemia

There were 278 cases of leukemia and accounted 7% of all cases, of them 63% were male and 37% were female patients. Leukemia ranked the third cancer for all patients, second for male and fourth among female cases. The median age at diagnosis was 27.7 years old (ranged from 1- 80). The most affected age groups were 0-9, followed by 10-19, and more than 90% of leukemia cases were aged less than 40 years. In previous study by Abdul Hamid et al 2015, the predominant age groups were 21-50 years in AML, 11-30 years in ALL, 41-50 years in CML and 51-60 years in CLL.^[15] The age ranges in these series agrees with previous studies in Africa.^[16] The difference in the age incidence observed in this study when compared to the western countries may be due to the interplay of both environmental and racial factors.^[17] The age-standardized incidence rate for leukemia is 8.8% in the US, 6.3% in Jordan, 5.4% in Egypt, 4.2% in Yemen and 3.9% in Saudi Arabia.^[4,18] In this study acute leukemia accounted 71.2% of all leukemia cases (acute lymphoblastic leukemia accounted 44.2% and acute myeloid leukemia accounted 27%).

Gastrointestinal cancers are the most frequent malignancies in Yemen.^[19-20]

Stomach cancer accounted 4.7% of all cases (175 cases) of them 67% were male cases and male to female ratio was 2:1. Stomach cancer ranked the sixth for all cases, fourth for males and twelfth among female cases. The median age at diagnosis was 53 years and about 70% of all stomach cancer patients were aged more than 50 years. A previous studies by Al-Samawi et al in Yemen and Komolafe et al in Nigeria has shown that adenocarcinoma accounts, for the highest number of stomach cancers in 5th and 6th decades with male preponderance as well as high frequency of well-differentiated grade.^[21-22]

CONCLUSIONS

These statistics can also assist in exploring, thus highlighting the putative risk factors associated with cancers commonly diagnosed in Yemen as part of a health promotion and education program and play role in developing prevention, early detection and cancer control strategies in Yemen.

The establishment of a national oncology program with regional access to NOC treatment centers is the first step. The establishment of a cancer board, its signing of the WHO framework convention on tobacco control and its

support of the hepatitis vaccination program. Development of the national oncology program outlining the scope of cancer control, prioritization of objectives and the development of indicators to evaluate the success attaining objectives.

ABBREVIATIONS

NHL: non-Hodgkins lymphoma, HL; Hodgkin's lymphoma, CNS; Central nervous system, NOC; National oncology center.

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